ROUND OF RIFLE AMMUNITION AND METHOD FOR MAKING SAME

RELATED APPLICATIONS

This application claims the benefit of provisional application S.N. 60/174,797, filed January 6, 2000, entitled: ROUND OF RIFLE AMMUNITION AND METHOD FOR MAKING SAME.

BACKGROUND OF INVENTION

This invention relates to rifle ammunition of 50 caliber or less, particularly to ammunition for rifles and wherein the projectile thereof is propelled from the rifle barrel at a subsonic velocity, and to methods for the manufacture of rifle ammunition.

In certain shooting situations, it is desirable that the projectile fired from a rifle travel at less than supersonic velocity. This shooting situation commonly occurs in the course of military and law enforcement activities, such as in sniper fire or other activity where it is desired that the location of the shooter not be detectable by reason of the sound associated with the firing of the rifle and the path of travel of the projectile.

Rifle ammunition heretofore intended to provide for subsonic velocity of the projectile thereof upon firing of the ammunition commonly has been manufactured by simply reducing the quantity of gun powder loaded into the case of each round of the ammunition. This procedure leaves a very substantial portion of the interior volume of the case void of either powder and/or projectile. The gun powder within the case, therefore, is free to flow into one or the other end of the case, depending upon whether the rifle being used is aimed upwardly from the horizontal or downwardly from the horizontal. When the powder shifts to the leading end of the case (adjacent the projectile and away from the primer in the closed end of the case), the flame generated upon the firing pin striking the primer must pass through a void space between the primer and the powder. This situation creates at least two undesirable factors, namely: (a) delay in ignition of the powder and/or (b) poor exposure of the powder to the flame pattern. The first of these factors can be so serious as to cause the shooter to believe that he has experienced a misfire, or to cause the shooter to pull his sight off the target. The second of these factors may result in insufficient ignition of the powder and a burn pattern which causes inconsistent propulsion of the projectile from the rifle, hence inability of the shooter to hit a desired target. When the powder shifts toward the primer-containing closed end of the case, these factors are generally reversed, causing supersonic velocity of the projectile and other deleterious results.

When firing ammunition from a rifle operated in either the automatic or semi-automatic firing mode, and wherein the bolt of the rifle is gas-operated off the gases generated by the burning gun powder within the case, successful consistent operation of the bolt is dependent upon the maintenance of a minimum gas pressure within the barrel of the rifle behind the projectile as it moves along the barrel and past the gas port leading from the barrel to the bolt-actuating mechanism. Failure to develop and maintain this minimum gas pressure results in failure of the bolt to operate. Known prior art rifle ammunition which is represented to be capable of firing a projectile at a subsonic velocity is known for its inability to consistently develop the required minimum gas pressure for operation of the bolt, hence is normally not suitable for use in rifles having gas-operated bolts.

It is therefore an object of the present invention to provide a round of rifle ammunition which consistently (from round to round) propels its projectile from the rifle at less than supersonic velocity.

It is another object to provide a "subsonic" round of rifle ammunition which, when fired in a rifle having a gas-operated bolt, consistently (from round to round) successfully operates the bolt of the rifle.

It is another object to provide a round of ammunition suitable for firing from a rifle having a gas-operated bolt wherein the projectile for the round is propelled from the rifle at a subsonic velocity and wherein the gas pressure developed within the rifle barrel and the bolt-actuating mechanism consistently performs the bolt actuation from round to round of the ammunition.

It is another object to provide a method for the manufacture of a round of rifle ammunition suitable for use in a rifle having a gas-operated bolt and wherein the rifle is operated in an automatic or semi-automatic mode and the projectile of the round exits the rifle barrel at a subsonic velocity.

Other objects and advantages of the present invention will be recognized from the present specification, including the claims and the drawings appended hereto.

BRIEF DESCRIPTION OF THE DRAWINGS:

Figure 1 is a representation, part in section, of a round of rifle ammunition embodying various of the features of the present invention;

Figure 2 is a representation, part in section, of another embodiment of the round of rifle ammunition depicted in Figure 1;

Figure 3 is an exploded view of various of the components of a round of ammunition in accordance with one aspect of the present invention;

Figure 4 is a representation of a portion of the trailing end of a further embodiment of a projectile having an alternative structure for positionally stabilizing the gun powder within the case of a round of ammunition.

Figure 5 is a representation of a still further embodiment of a projectile having an alternative structure for positionally stabilizing the gun powder within the case of a round of ammunition.

Figure 6 is a side view of a cotton fiber disc which is also depicted as a component of Figure 3; and

Figure 7 is a side view of a paper disc which is also depicted as a component of Figure 3.

SUMMARY OF INVENTION

In accordance with one aspect of the present invention there is provided a round of rifle ammunition, particularly for use in rifles having a gas-operated bolt and capable of being fired in the automatic or semi-automatic mode. The ammunition of the present invention is structured to propel the projectile of a round of the ammunition from the rifle at less than supersonic velocity, consistently from round to round of the ammunition. Further, each round of the ammunition, when fired, develops and sustains within the rifle, not less than that minimum gas pressure which consistently successfully operates the bolt of the rifle when the rifle is fired in the automatic or semi-automatic mode.

In accordance with one feature of the present invention, gun powder is deployed and positionally stabilized within that end of the case of each round of ammunition adjacent the primer, irrespective of the positional attitude of the rifle at the time of firing. Moreover, such positionally stabilized gun powder is substantially free of void spaces which might introduce random excursions in the ignition, burn rate, etc. of the gun powder sufficient to adversely affect either the velocity of the projectile fired from the rifle or the build-up and sustainment of sufficient gas pressure for consistent successful operation of the gas-operated bolt of the rifle.

Another aspect of the present invention relates to the ability to use a tapered projectile with its enhanced flight characteristics, hence accuracy of delivery of the projectile to a target, when fired at a subsonic velocity. This tapered projectile further develops less surface friction, hence less heat, as it travels through the rifle barrel, thereby reducing the buildup of barrel heat during sustained firing cycles.

Further, the tapered projectile has been found to produce less wear and fouling of the internal bore of the barrel. The ammunition of the present invention has been found to be suitable for firing in a standard military M16M4 rifle (5.56 mm) having a 14.5 inches long barrel of seven twist.

DETAILED DESCRIPTION OF INVENTION

In Figure 1 there is depicted one embodiment of a round of rifle ammunition 12 in accordance with the present invention and including a standard case 14 having a trailing end 16, an open leading end 18, and a body 20 which includes a generally hollow tubular portion 22 that transitions into a "necked down" tubular portion 24. The trailing end of the case is substantially closed and includes a primer port 26 within which there is disposed a primer 28. The primer port is accessible from exteriorly of the case and includes a flame port 30 leading therefrom and into the interior

volume 32 of the case. Notably, the flame port 30 comprises a straight through bore having an inwardly terminal opening 32 whose rim 34 is defined by the junction of the straight wall of the through bore with the inside bottom wall 36 of the case which is oriented normally of the wall of the through bore. By this means, the rim 34 is sharply defined so that a flame generated by the firing of the primer exits the flame port in a substantially collimated flame that projects itself into the adjacent powder charge 38 to ignite the powder charge interiorly thereof and along the axial length of the powder charge. When the powder charge is disposed adjacent the primer and the trailing end of the case, the powder charge thus burns uniformly substantially radially outwardly from its axial centerline, creating a uniform and consistently sustained burn of the powder, resulting in uniform and consistently sustained buildup of gas pressure within the rifle barrel sufficient to operation the gas-operated bolt fo the rifle.

As noted, the charge of gun powder 38 is disposed within the case adjacent the trailing end of the case to a level 52 located within the body portion of the case. In accordance with one aspect of the present invention, this charge of gun powder occupies materially less than the interior volume of the case, in one embodiment only about 50% of the interior volume of the case. This volume of slow-burning gun powder assures that there will be sufficient gas pressure built up to propel a projectile 40, disposed in and closing the leading end of the case, from a rifle at a

subsonic velocity while simultaneously generating and sustaining that minimum gas pressure within the rifle as will operate the bolt of the rifle. The choice of the particular gun powder to be employed in a given caliber round of ammunition, the volume of the chosen gun powder, its burn rate, etc. have heretofore been thought by those skilled in the art to require relative small charges of a fast-burning powder, such as a pistol powder. To the contrary, the present inventor employs a gun powder which is industry rated as being a very slow burning powder. As noted, irrespective of the gun powder type actually used, the present invention addresses the problem of keeping the powder charge positionally stable within the case and adjacent the trailing end of the case, preferably with few or no void spaces within the volume of powder. To this end, the present inventor has found that a powder charge which does not fully fill the interior volume of the case can be held as a coherent charge within the case and adjacent the trailing end of the case, hence adjacent the primer, by means of a disc 50 which is inserted through the open end of the case proximate the level 52 of the gun powder in the case. This disc is self-supporting and of a circumference which substantially matches the internal circumference of the case at the location of the top surface 52 of the powder charge held in the case. The disc 50 is overlaid upon the top surface of the powder within the case and preferably has its circumference in frictional engagement with the inner wall of the case. Thereafter, the proximal end 56 of the elongated projectile 40 is inserted into the case through the open

leading end of the case. In the depicted embodiment, the proximal end 56 of the projectile is flat and defines a flat surface 58 which is oriented substantially normal to the length dimension of the projectile. In a preferred embodiment, this flat proximal end of the projectile extends to a location which is contiguous to and preferably contacting, but not pressing against the top surface 60 of the disc or is disposed spaced apart from the top surface of the disc by a short distance, 0.1 inch for example, but not farther away from the disc than by a distance greater than about one-half the diameter of the disc.

The disc 50, being of a diameter greater than the internal diameter of the necked-down portion of the case, must be sufficiently flexible as permits the disc to be folded to the extent necessary for it to pass through the necked-down portion of the case, and sufficiently resilient to substantially resume its flat disc geometry once it is inside the body portion of the case. One suitable disc for use in the present invention comprises a disc die-cut from common "target stock" paper used in the manufacture of rifle targets. "100 yard target stock" purchased from Hohen Sales of Wright City, MO. has been found to be a suitable paper. This paper is about 0.014 inch thick and has a basis weight less than a postal card stock, for example. The disc may be die cut from a sheet of the paper. Such die-cutting of the disc results is compression of the thickness of the paper around the circumferential margin of the cut disc, to a thickness of about

0.010 inch, hence a stiffening of the disc within such circumferential margin.

This stiffening has been found to be useful in the ability of the disc to resist that deformation thereof which might lead to the escape of powder particles from the powder charge and into that portion of the interior volume of the case which is on the leading end side of the disc when the disc is disposed within the case in engagement with the top surface of the powder charge. It is contemplated that other paper stock may be employed, as well as other materials of construction for the disc. In any event, it is of importance that the disc be rapidly disintegrated in the presence of the burning of the powder charge so that no material unburned portion of the disc will pass into the gas transfer system employed in connection with the operation of the bolt of the rifle.

The round of ammunition depicted in Figure 1 includes a projectile 40 preferably formed from a core 62 of compacted a blend of a heavy metal powder, such as tungsten powder, and a lighter metal powder, such as tin powder, encased within a copper jacket 66. Alternatively, the projectile may be of any of the commonly known metals, metal powders, metal alloys, and the like, which are used in the manufacture of projectiles for rifle ammunition. In the round of ammunition depicted in Figure 1, the length of the projectile is such as provides for at least the distal end 68 of the projectile to project outside the leading end 18 of the

case, and for the flat proximal face 51 of the proximal end 56 of the projectile to project inwardly into the interior volume of the case. As depicted, preferably, the proximal end 56 of the projectile extends to a location within the case whereby the proximal face 51 of the projectile is disposed immediately adjacent the distal surface 53 of the disc 50, which in turn, is in overlying engagement with the top surface 52 of the powder charge 38. This positional relationship of the flat face of the projectile with the disc and powder charge serves to contain the powder charge within its desired position within the case and adjacent the primer end of the case, with no material void spaces within the powder charge. Thus, the powder charge does not alter its position within the case irrespective of the orientation of the gun from which the round is fired.

The ability to employ a longer-than-normal projectile within the case of a given caliber round of ammunition provides the ability to employ heavier-than-normal projectiles. This ability to employ a heavy projectile, along with a "reduced" volume of slow burning gun powder for a given caliber round of ammunition permits one to build up, and sustain, the required gas pressure within the rifle as is necessary to operate the bolt of the rifle when it is fired in the automatic or semi-automatic mode, in particular. Of course, single shot firing of an automatic or semi-automatic rifle is also possible and the ammunition of the present invention will

also operate the gas-operated bolt of the rifle during such single shot firing.

In the prior art, it has been taught that if one desires to manufacture a round of ammunition for a rifle of a given caliber wherein the projectile of the round is propelled from the rifle at less than supersonic velocity, reduction of the volume of the gun powder used, and employing a fast burning gun powder, will serve this purpose, keeping all other components of the round unchanged from the supersonic version of the given caliber round. Aside from the problems stated hereinabove relative to the movement of the gun powder within the case as a function of the position of the rifle at the time of its firing (aimed up or down or horizontal), these prior art efforts have failed to provide for consistent buildup of the required gas pressure within the rifle for operation of its gas-operated bolt. This problem in the prior art lead to the conventional wisdom that subsonic ammunition requires a fast burning powder. The present inventor has found that the round of ammunition provided by the present invention can be made to function with slow burning powder. One suitable gun powder is Hodgdon H50BMG. The relatively high density (such as tungsten powder) of the projectile employed by the present inventor offers such initial resistance, and/or friction and drag within the barrel of the rifle that the present inventor has found that a slow burning powder may be employed without causing the slow burning powder to propel the projectile from the

rifle barrel at a supersonic velocity. This combination also functions to build up within the rifle barrel the desired gas pressure for consistently operating the bolt of the rifle, still without the projectile being propelled from the barrel at a supersonic velocity.

In a specific example, rounds of 5.56 mm ammunition were manufactured employing a commercial case for this caliber ammunition. Twelve grains of Hodgdon H50BMG gun powder was loaded into the case which had been fitted with a conventional primer. A die-cut disc of "target stock" paper of about 0.014 inch thickness was introduced into the case and overlaid on the exposed top surface of the powder change. The disc was compressed about its circumferential margins to about 0.010 inch thickness. A 150 grain powder-based projectile, 1.24 inches in length, was introduced into the case to a depth such that the overall length of the round (from the outermost tip of the projectile to the bottom end of the case) was not greater than 2.260 inches, this length being the standard length of a round of 5.56 mm ammunition which is intended to be fed from a magazine into the firing chamber of a rifle which accepts this ammunition. In one embodiment, once the projectile was positioned within the case, the necked-down portion of the case was crimped, i.e. cannelured, to retain the projectile in the case preparatory to firing. In this embodiment, the flat proximal face of the projectile was disposed within less than 0.10 inch of the top surface of the disc. These

rounds were fired from a standard M16M4 military rifle having a barrel length of 14.5 inches and a 1 in 7 twist. Five shot firing patterns provided a standard deviation in projectile velocity of less than 15 fps with no round producing a supersonic firing. In fact, firing of five hundred rounds of the present ammunition did not result in a single supersonic excursion. These rounds also consistently operated the gas-operated bolt of he rifle in both automatic and semi-automatic modes. Moreover, the accuracy with which these rounds struck a target placed 100 yards out was surprisingly better than anticipated. For example, five shot firing patterns consistently resulted in groupings of 2 ½ inches with an extreme spread not greater than 4 inches at 100 yards.

In one alternative embodiment, the projectile employed in the present invention may be tapered in that the diameter of the projectile from the ogive to the flat end of the projectile increases. In one embodiment, the taper, along the length of the projectile, on a 5.56 mm round ranged from between a diameter of 0.22420 and 0.22430 inch at the proximal end of the projectile to between about 0.22390 and 0.22400 at the location of the transition of the body portion of the case into the necked-down portion of the case. Preferably, this tapered projectile is provided with at least one cannelure 70 within that portion of the length of the projectile which resides within the necked-down portion of the case. The indentations of the cannelure, in one embodiment, may be about 0.040 inch in depth. The frictional engagement between the

radially inwardly bulging edge of the cannelure depression provides sufficient friction to hold the projectile suspended within the case without interfering with the performance of the round of ammunition when fired.

Referring to Figure 2, in a further alternative embodiment, the inventor has found that the addition of a further disc 80 interposed between the disc 50 and the flat proximal end of the projectile enhances the stability of the position of the disc 50 and provides enhanced protection against escape of gun powder particles between the circumferential edge 82 of the disc 50 and the interior wall 84 of the case. This further disc may be a second paper disc, but preferably comprises a disc of non-woven cotton fibers, such as the loosely bound cotton found in Cotton Rounds, sold by Sentinel Consumer Products, Mentor, OH as Item 2834, for cosmetic and baby care. This further disk includes a multiplicity of tortuous pathways through its thickness and therefore functions as a filter for the capture of gun powder particles which may escape past the disc 50. As is true with the paper disc, it is most desirable that the fibrous material comprising the paper or cotton disc burn very quickly and with a minimum ash residue. As currently understood, the weight of cotton fibers making up the cotton disc preferably is between about 0.10 and 0.16 grains, but heavier weights of the cotton disc have been employed successfully.

In a still further alternative embodiment, (see Figure 4) the projectile of the present round of ammunition may include a rebated boattail 90 trailing end such as depicted in Figure 4 and further be provided with a hollow fast-burning cellolosic material in the form of a common drinking straw 92 which has one of its ends frictionally engaging the rebated boattail 90 of the projectile to extend therefrom to cause its opposite end to engage, or to be in near proximity to, a disc (or plurality of discs) disposed in overlying relationship to the top surface of the gun powder charge. By this means, the trailing end of the projectile may be spaced a considerable distance away from the disc(s) while the "straw" serves to aid in retention of the disc in its overlying position relative to the gun powder charge. If desired, the rebated boattail depicted in Figure 4 may be omitted and only the "straw" used to engage the disc(s) as depicted in Figure 6. It will be obvious to one skilled in the art that other forms of a spacer may be employed to establish and maintain a desired separation between the end of the projectile and the disc(s).

Whereas the present invention has been described in specific terms and examples, one skilled in the art will recognize alternatives. For example, whereas each of the discs 50 and 80 have been described as having opposite planar parallel sides, it will be recognized that one or more of the sides of the discs may suitably be concave or convex as the case may be.